.

Available Goddard Space Flight Center Services

This Description applies only to proposals in response to NASA's Announcement of Opportunity for Small Explorers (SMEX) and Missions of Opportunity

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Goddard Space Flight Center (GSFC) services are offered in GSFC's core competency areas of sensors and instruments, end-to-end mission systems engineering, and advanced flight and ground systems development. For Step 1 proposals, the 40 hours of service offered at no cost to the PI can be spread across all three areas or concentrated on some subset of them – at the PI's discretion. Typical support provided in each area is as follows:

Sensors and Instruments:

- General overview of sensor/instrument applicability to the stated science objective(s)
- Assessment of the technical feasibility of the proposed sensor(s)/instrument(s)
- Grass roots cost estimate of the proposed sensor(s)/instrument(s)

End-to-end mission systems engineering:

- General systems engineering assessment of the proposed mission concept
- Assistance in the creation of a science requirements traceability matrix
- Assistance in the identification of top technical risks and mitigation methods

Advanced flight and ground systems development:

- General overview of the proposed flight and ground system
- Assistance in the creation of a data flow diagram with related frequency band(s), ground station(s), and data rate(s)
- Grass roots cost estimate of the proposed flight and ground system

For Phase A concept studies, GSFC will provide support in these core competency areas to the extent required by the PI to complete the study. In addition, GSFC will also provide support in its project management core competency area during Phase A studies. Phase A support is provided on a full-cost basis. Of special note to all PIs is the fact that NASA procurement regulations require industry partners to be selected competitively if GSFC is to manage the mission. GSFC will require the PI to demonstrate that such a process has been or will be conducted prior to entering in to any teaming arrangement for the concept study.

To obtain these services, PIs should contact Mr. William Cutlip of GSFC's New Opportunities Office. Mr. Cutlip will serve as the point of contact and coordinator for GSFC-provided services. In this role, Mr. Cutlip will interact with PIs to understand the needs, scope the effort, develop action plans and make arrangements to satisfy them. Information to contact Mr. Cutlip is provided below:

Mailing address	NASA/GSFC Code 101 William Cutlip, Chief (acting), New Opportunities Office Greenbelt, MD 20771
Permanent email address	william.e.cutlip@nasa.gov
Business phone	301 286-0438
FAX number	301 286-1714

Other GSFC Services

In addition to the services noted above, GSFC offers focused, discrete services in the areas of spacecraft acquisition; mission concept design; instrument synthesis/analysis; mission operations; and Space Shuttle/Space Station attached payload-related mission integration engineering and management, safety, mission implementation and carrier development. Each of these discrete services has well-defined products, which are described in the following sections. These services are offered in both Step 1 and Phase A as available resources permit. The cost of services, and acceptable means of payment, should be discussed directly with the designated point of contact for the service.

Rapid Spacecraft Development Office (RSDO)

The Rapid Spacecraft Development Office (RSDO) services include the following:

- The definition, competition and acquisition of multiple (currently 8) "Indefinite Delivery, Indefinite Quantity" (IDIQ) spacecraft contracts (Rapid II) that offer NASA and other U.S. Government agencies a quick procurement tool for numerous spacecraft buses from a variety of U.S. and Foreign aerospace vendors. The Rapid II contracts provides for
    - The modification of buses and contract terms & conditions to meet customer/mission needs
    - Requests for Information
    - Instrument requirements definition & accommodation studies
    - The competitive award of a fixed-price spacecraft bus Delivery Order 30 to 90 days after Request for Offer (RFO) release
    - Management of awarded Delivery Order transferred to customer's federal government contracting officer (The use of the RSDO does **not** make GSFC a partner in the mission)
- The "Quick Ride" contract that offers NASA's science and technology missions a ride opportunity as a secondary payload on established commercial assets.
- The "Access To Space" (ATS) interactive mission design web site that provides both information and the tools necessary to plan and select rides on orbital and sub-orbital launchers (excluding the NASA Space Shuttle).

Currently, there are 21 core spacecraft bus configurations in the RSDO catalog. Additional information can be found at http://rsdo.nasa.gsfc.gov.

BUS CONFIGURATIONS	
COMPANY	SPACECRAFT BUS
Astrium (Germany)	FLEXBUS
Ball Aerospace	BCP600, BCP2000
Lockheed-Martin	LM900
Orbital Science Corporation	PICOSTAR, MINISTAR, MICROSTAR, STARBUS, LEOSTAR-2 & MIDSTAR
Spectrum Astro	SA-200B, SA-200S & SA-200HP
Surrey (United Kingdom)	SNAP, MICROSAT-70 & MINISAT-400
Swales	EO-SB
TRW	T100, T200A, T200B & T310

RANGE OF BUS CAPABILITIES	
Lifetime	1 to 10 years
Max Avg. Payld Power (EOL)	2.5 to 730 Watts
Payload Mass Limit	3 to 780 kg
Science Data Downlink Rate	38 kbps to 320 Mbps
Downlink Band	S-Band & X-Band
Science Data Storage Capacity	0 to 134 G-bits
Attitude Control Systems	3-axis stabilized & spinner
Propulsion	None, GN2, N2H4, Hydrazine
Orbits	LEO, MEO, GEO & Sun-Synchronous

Mailing Address:	NASA/GSFC Code 406 Gregory F. Smith, Chief, Rapid Spacecraft Development Greenbelt, MD 20771
Web Pages	http://rsdo.gsfc.nasa.gov
Permanent email address	Gregory.F.Smith@nasa.gov
Business phone	1-301-286-1289
FAX number	1-301-286-0530

Integrated Design Capability (IDC)

The NASA Goddard Integrated Design Capability (IDC) is a human and technology resource that provides rapid development of space system analysis and conceptual designs. Skilled engineers and scientists utilize the IDC's collaborative process and sophisticated tools to produce detailed space mission, remote sensing instrument, and/or technology applications design concepts. The IDC has two dedicated facilities where the IDC design teams and the customers collaborate in environments that promote rapid development of and efficient trade studies for space system architectures, applications and concepts. The Integrated Mission Design Center (IMDC) is the mission design facility and the Instrument Synthesis and Analysis Laboratory (ISAL) is the instrument design facility.

IDC services include:

- Full end-to-end studies including system/subsystem concepts, requirements and trades
- Focused studies
- Independent assessments of Investigator-provided studies/concepts
- New technologies and risk assessments

Integrated Mission Design Center (IMDC)

The IMDC provides specific mission engineering analysis and provides end to-end mission design products. IMDC mission design sessions are typically one full week and are tailored to fit an investigator's specific mission requirements. The IMDC will provide support ranging from one day brainstorming sessions to an extended design session, as required. IMDC personnel will work with the Investigator Team prior to the mission design session to understand the mission goals and objectives, the science driving requirements, the instrumentation and mission configuration and architecture, and the goals of the IMDC session. The Investigator is a key member of the IMDC process and during the study period is the integral decision-making member in the IMDC. This partnership engages the Investigator in the design process and provides him/her the opportunity to influence and refine the mission study objectives throughout the design process. This enables the IMDC to make the best decisions in real time and has been proven to result in the best product to meet the Investigator's needs.

Instrument Synthesis and Analysis Laboratory (ISAL)

The ISAL provides instrument design and analysis services to investigators and instrument teams. The ISAL focuses on individual scientific instruments. This laboratory was created to provide end-to-end capabilities for modeling, analysis and simulation for Earth and Space science remote sensing instruments. Design and analysis tools are integrated to facilitate quick and efficient analyses covering areas such as structural, thermal, optical, jitter, mechanisms, electronics, detailed radiometry, spectrometry, hyperspectral imaging, and interferometry. Performance modeling (physics-based functional modeling) and integrated physical or geometric modeling (structural, optical, thermal, etc.) are accomplished for both performance analyses and for time-domain simulations. This capability allows efficient trade-offs of instrument concepts and architectures, including cost and performance validation. As in the IMDC, the investigator is a key member of the ISAL process and

during the study period is the integral decision-making member in the ISAL. A typical ISAL instrument design study can be executed over a 2-week period.

To obtain more information regarding the use of IDC services, Investigators should contact Ms. Ellen Herring, the IDC Operations Manager. Initial IDC interaction with Investigators will result in the understanding of Investigators' needs, the development of strategies to meet these needs, and the scheduling of follow-up IDC, either IMDC and/or ISAL activities as deemed necessary. Information to contact the IDC is provided below.

Mailing Address:	NASA/GSFC Code 500 Ellen Herring, IDC Operations Mgr Greenbelt, MD 20771-0001
Web Pages	http://idc.gsfc.nasa.gov/ http://imdc.nasa.gov/ http://isal.gsfc.nasa.gov/
Permanent email address	Ellen.L.Herring@nasa.gov
Business phone	1-301-286-7393
FAX number	1-301-286-0343

Shuttle Small Payloads Project Office (SSPPO)

The Shuttle Small Payloads Project Office (SSPPO) and its industry team have flown over 265 experiments on 58 Shuttle flights since its first mission in 1982. Modular and extensible carrier systems including structures, avionics, ground systems, and associated management systems have been developed by SSPPO to support a wide range of payload size and complexity ranging from about 227 kg (500 lb) to over 2270 kg (5000 lb). As a natural follow-on to existing Shuttle payload experience, the SSPPO is now prepared to provide the carrier systems, mission integration and launch operations services needed to accommodate proposed instruments on the ISS Japanese Experiment Module – Exposed Facility (JEM-EF) and ISS full truss site

In this capacity, SSPPO can provide the following services:

STS/ISS Mission Integration and Interface Management

SSPPO will act as the point of contact for the shuttle and station Mission Integration Engineering Process. In this capacity SSPPO responsibilities will entail coordination and development of Mission Integration Engineering documentation products in consort with JSC, KSC, the instrument developer, and PI including but not limited to STS and ISS Payload Integration Plans (PIP), PIP Annexes and Payload-to-Orbiter/ISS ICDs

The SSPPO will provide management and engineering to support the mission integration of the payload into the STS and ISS.

Shuttle and Space Station Flight and Ground Safety Engineering and Documentation

SSPPO will interpret and provide guidance of Space Shuttle and Space Station Program Flight and Ground safety requirements through PDR, CDR, design, development, test, integration and shuttle and ISS operations phases of the mission. SSPPO will identify and coordinate milestones associated with scheduling of safety data submittals from the instrument developers. Upon receipt of submitted documentation from the instrument developers, SSPPO will review Safety Data Packages (SDPs) and related material and recommend enhancements as appropriate. Upon completion of this process the SSPPO will submit SDPs to JSC and KSC Payload Safety Review Panels (PSRPs) and schedule safety Technical Interchange Meetings (TIMs) and safety reviews. During the safety TIM and PSRP review process, SSPPO will provide assistance in preparation of the review presentation material and will provide support during the safety review process. SSPPO incorporates all carrier components into an integrated Phase II then Phase III SDP (Flight and Ground) and is accountable for all safety related to the carrier equipment and instruments.

Thermal Systems and Interface Management

The SSPPO will manage all thermal interfaces with the STS and ISS, providing analysis and modeling of the payload and vehicle to the level necessary to support the requirements imposed by the STS and ISS. SSPPO will provide thermal expertise with respect to instrument safety assessment.

Payload Integration and Launch Operations Support

The SSPPO will manage and implement the integration of the PI's instrument(s) into the carrier and the integrated payload into the STS and ISS. The SSPPO will interface with all

the organizations at KSC and GSFC during the integration process. Specific details regarding SSPPO's activities during the integration process should be discussed directly with SSPPO.

Flight Operations Support

SSPPO will provide Mission Flight Operations Management for the mission supporting the up and down ride in the STS and the deployment and subsequent retrieve activities for ISS

Mechanical Systems and Interface Management

The SSPPO will manage all mechanical interfaces with the STS and ISS, providing drawings, analysis and modeling of the payload and vehicle to the level necessary to support the requirements imposed by the STS and ISS. SSPPO will provide mechanical systems expertise with respect to instrument safety assessment.

Electrical Systems and Interface Management

The SSPPO will manage all electrical interfaces with the STS and ISS, providing analysis and modeling of the payload and vehicle to the level necessary to support the requirements imposed by the STS and ISS. SSPPO will provide electrical systems expertise with respect to instrument safety assessment.

In the domain of carrier formulation and development engineering and management services, the SSPPO will provide:

Carrier Formulation and Development Engineering and Management

The SSPPO will manage and perform the formulation and development of a carrier system for either the JEM EF or full truss site providing an engineering team cognizant of the relevant STS and ISS technical interfaces and payload verification processes.

The SSPPO will provide a management team and supporting administrative personnel to manage this effort as well as the qualification test program, instrument to carrier integration, and payload to STS /ISS integration.

Carrier Qualification Test Program Development and Implementation

The SSPPO will develop a test program to qualify the carrier structure for STS and ISS environments and implement the test program using GSFC test facilities

Instrument to Carrier &Payload to STS/ISS Integration Engineering and Management

The SSPPO will provide the integration and test management and implementation of the PI's instrument(s) to the carrier system and then the integrated payload to the STS/ISS. The SSPPO will generate all the necessary required KSC documents that support launch and integration activities at the KSC.

Mailing Address:	NASA/GSFC Code 870.G Gerry Daelemans, Chief, Shuttle Small Payloads Project Office Greenbelt, MD 20771
Web Page	http://sspp.gsfc.nasa.gov/
Permanent email address	Gerard.J.Daelemans@nasa.gov
Business phone	301 286-8799
FAX number	301 286-0343

Space Science Mission Operations (SSMO) Project

The Space Science Mission Operations (SSMO) Project has the responsibility for Project Management for the operations and maintenance of current GSFC operational space science missions. The SSMO Project is responsible for future GSFC space science missions usually after orbital verification is complete and routine operations are underway. However, the SSMO Project is involved in the mission development phases of new missions to assure safe and effective mission operability.

The SSMO Project plays a significant role during the various phases of the mission life cycle from the formulation and approval phases through the implementation and evaluation phases and eventual deactivation. The complexity, cost, and risk of operations may be dramatically affected by decisions made early in the development cycle. A major objective of the SSMO Project, in conjunction with the science community, is to transfer lessons learned from operations into the operations requirements and operations concept development phases of future missions.

The SSMO can provide assistance for the following disciplines:

- General consulting on mission operations concepts and applicability of existing Space Science mission concepts and architectures
- Assistance in obtaining cost estimates for GSFC mission operations contract alternatives
- Assistance in orbit design alternatives to meet the stated science objective(s)

Mailing Address:	NASA/GSFC Code 444 Ron Mahmot Greenbelt, MD 20771
Web Page	
Permanent email address	Ronald.E.Mahmot@nasa.gov
Business phone	301 286-8523
FAX number	301 286-1602

GSFC Mission Services Evolution Center (GMSEC)

GMSEC provides mission operations systems that perform the following functions:

- Telemetry processing
- Real time and stored command generation
- Mission activity planning and scheduling
- Engineering data trend analysis
- Level zero processing
- Spacecraft simulation
- Orbit determination and prediction
- Attitude sensor calibration.

In addition, GMSEC maintains an architecture that allows these functions to be easily integrated and invests in new technology to enable new capabilities, lower costs, and reduce operations risk.

The GMSEC services include the design and implementation of some or all of the mission operations systems for a mission and the training of the operations team in its use. The GMSEC architecture is modular, designed to accommodate components from other sources. The GMSEC mission operations systems can be located at the users facility. The GMSEC telemetry and command functions can be used to support spacecraft and observatory integration and test.

Mailing Address:	NASA/GSFC Code 581 Dan Smith Greenbelt, MD 20771
Web Page	
Permanent email address	Danford.S.Smith@nasa.gov
Business phone	301 286-2230
FAX number	301 286-5719